

WHAT IS CLAIMED IS:

1 1. A motor vehicle steering device comprising:
2 a variable gear ratio system that varies a rotational movement transmission ratio
3 between a first steering shaft that rotates with a steering wheel as a unit and a second
4 steering shaft connected to a turning rod for turning a turning ring, wherein
5 said variable gear ratio system comprises:
6 a drive motor;
7 a motor shaft for transmitting rotation of said drive motor's output shaft;
8 and
9 a speed reducer for modifying the transmission ratio between a rotation
10 input entered by said first steering shaft and a rotation output emitted to said second
11 steering shaft in accordance with the rotation of said drive motor;
12 said motor shaft and said second steering shaft are a substantially concentric dual
13 structure; and
14 said drive motor is fixedly installed and unaffected by said rotation of said first
15 steering shaft and said second steering shaft wherein said output shaft is connected to said
16 motor shaft.

1 2. A motor vehicle steering device of claim 1, wherein
2 said speed reducer is a Strain Wave Gearing Speed Reducer.

1 3. A motor vehicle steering device of claim 1, wherein
2 said speed reducer is a planetary gearing reducer.

1 4. A motor vehicle steering device of claim 1, wherein said second steering
2 shaft has a hollow through-hole, and
3 said motor shaft passes through said hollow through-hole.

1 5. A motor vehicle steering device of claim 1, wherein said motor shaft has a
2 hollow through-hole, and said second steering shaft passes through said hollow
3 through-hole.

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5 6. A motor vehicle steering device of claim 1, further comprising a rack gear
6 formed on said turning rod whereas a mating pinion gear is formed on said second steering
7 shaft, and

8 said rack gear meshes with said pinion gear in a steering gear box, which contains
9 at least portions of said turning rod and said second steering shaft.

1 7. A motor vehicle steering device of claim 6, wherein
2 said variable gear ratio system containing said drive motor and
3 said reducer is built into said steering gear box.

1 8. A motor vehicle steering device of claim 1, wherein said output shaft and
2 said motor shaft are connected indirectly to each other via a gear train.

1 9. A motor vehicle steering device comprising:
2 a variable transmission ratio mechanism that varies a rotational movement
3 transmission ratio between a first steering shaft that rotates with a steering wheel as a unit
4 and a second steering shaft connected to a turning rod for turning a turning ring, wherein
5 said variable transmission ratio mechanism comprises:

6 a drive motor;
7 a motor shaft for transmitting a rotation of said drive motor's output shaft;
8 and

9 a speed reducer for modifying the transmission ratio between a rotation
10 input entered by said first steering shaft and a rotation output emitted to said second
11 steering shaft;

12 said motor shaft and said first steering shaft are a substantially concentric dual
13 structure; and

14 said drive motor is fixedly installed are unaffected by said rotation of said first

15 steering shaft and said second steering shaft with said output shaft is connected to said
16 motor shaft.

1 10. A motor vehicle steering device of claim 9, wherein
2 said first steering shaft comprises a transmission shaft for transmitting said first
3 steering shaft's rotating power, and
4 said first steering shaft's rotating power enters into said reducer via said
5 transmission shaft; and
6 said transmission shaft and said motor shaft are a substantially concentric dual
7 structure.

1 11. A motor vehicle steering device of claim 9, wherein
2 said speed reducer is a Strain Wave Gearing Speed Reducer.

1 12. A motor vehicle steering device of claim 9, wherein
2 said speed reducer is a planetary gearing reducer.

1 13. A motor vehicle steering device of claim 9, wherein
2 said motor shaft has a hollow through-hole, and said first steering shaft passes
3 through said hollow through-hole.

1 14. A motor vehicle steering device of claim 9, further comprising:
2 a rack gear formed on said turning rod whereas a mating pinion gear is formed on
3 said second steering shaft, and
4 said rack gear meshes with said pinion gear in a steering gear box, which contains
5 at least portions of said turning rod and said second steering shaft.

1 15. A motor vehicle steering device of claim 14, wherein
2 said variable gear ratio system containing said drive motor and said reducer is built
3 into said steering gear box.

1 16. A motor vehicle steering device of claim 15, further comprises:
2 an oil pump for generating hydraulic pressure; and
3 a power cylinder for driving said turning rod by means of oil pressure;
4 said first steering shaft comprises a torsion bar for generating a torsion that
5 corresponds to a rotating torque acting on said first steering shaft; and
6 said steering gear box is equipped with a servo valve constituted to switch a oil
7 passage from said oil pump to said power cylinder in accordance with said torsion bar's
8 torque.

1 17. A motor vehicle steering device of claim 9, wherein
2 said motor shaft is formed integrally with said output shaft of said drive motor.
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